

Review Comments on the PSS Generation 3 Non-Invasive Testing Methodology

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Review Committee:

Elroy Chang (not present), John Forrestal, P. K. Job (not present), Marty Knott, Jonathan Lang, John Quintana, Mohan Ramanathan

The review committee would like to thank the speaker(s) for enlightening the committee members on their proposal for the non-invasive testing methodology to be used for the PSS Generation 3 system.

The committee assumed that the charge for the committee was the following:

- **Are the designers in the right track in their approach for the new methodology for a non-invasive testing of the next generation PSS system?**

Summarized below is the general consensus.

The speakers presented the current process for testing of the PSS system. It was clear that the current process has lots of room for improvement. It is also clear that based on past experience that there is a need for more efficient testing of the PSS system. The current proposal to adapt a new approach to the PSS validation and testing is the right direction for this group to focus.

The reviewers focused on the new design and will not comment on any aspects of the existing process for the testing of the PSS system.

The proposed method of automatically sensing the presence of the test system is the right approach. The deviation from the current philosophy of physically disconnecting connector wires is clearly a correct approach. The methodology of designing the PSS system with provision for attaching simulators for testing, and the PSS system to sense it and properly disable the systems is the right approach.

The testing of the PSS system can take place during the operation of the storage ring. The front end shutters are part of the PSS, however they are also essential for the operation of the storage ring. For this reason, the PSS testing system has to isolate the front end shutters and simulate them. The air manifold for the front end shutter cluster is outside the control of the PSS system, and as such it involves an administrative procedure for the lock out of the air system. The designers are strongly urged to reduce the number of administrative processes, as they are the places where there is likely to be a mistake.

The process used for the method of disabling the inputs when the test system was connected was felt adequate. However the scheme used for disabling the outputs when the tester is connected was questionable. The fact that the testing will be used in a system

at the most two times a year, and as such using a relay which is energized all the time and will be de-energized only during the testing is questionable in terms of reliability. The reviewers feel strongly that other choices be explored before making the final decision.

The reviewers were informed that the PSS field devices like shutters, search buttons are tested end to end electronically. Subsequently for the whole PSS testing these signals are simulated. The committee feels that a final test of the complete system with shutters physically open and a crash button engaged (ESD) should take place as the last step of the test process.

The reviewers would like to commend the designers for the extensive analysis of the failure modes of the various components proposed in this new design.

Listed below are view and suggestions of specific issues:

- The on-line/off-line keyswitch for each beamline, located in the ACIS signal cabinet, captures the key in the on-line position and releases it in the off-line position. If this same key were required by the PSS testing system, it would guarantee that the beamline was off-line. This would, in turn, guarantee that the shutter air was cut off and that the ACIS would ignore any PSS trips issued during the testing. While not necessary to use this new PSS testing keyswitch for the disconnection of the shutter outputs, as discussed at length during the review, it would seem like a natural. In fact, this is similar to the way that the ACIS is disconnected from its controlled equipment, although the keys used do not serve any other purpose.
- Due to a change in the ACIS logic approved last fall by the RSPC, the ACIS ignores PSS faults as long as the shutters are closed even if the Global key is on line. However, if the Global key is left on line (break down in administrative procedures) and the PSS test mode invoked, we could end up in a situation where the shutters could be opened (if someone forgot to lock off the air or the where one last opening is possible if the air is not automatically vented from the shutters control line) and beam could be introduced into a beam line under test. Based on this scenario one of these two options could be adopted:
 1. Install the relays. The arguments against relays are based on reliability concerns but nuisance trips are far less "intrusive" to machine operations than the alternative. This is the most automatic way of ensure a safe operation of the system.
 2. Install a key switch or key switches so that the output control relays to the shutters are disabled unless the key is hard-wired present. Its second position would be in the test mode hardware and would disable the testing hardware from activating any circuits unless it is present.

Whether item 1 or 2 is implemented, disabling the contacts that connect to the pneumatic controller from the shutter control relays rather than the relay coil

would be a strong recommendation. This allows the PSS to control the coils (and monitor the relay's operation as part of the test process) but the shutters would not open because the pneumatic control never receives an enable.